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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,765	11/17/2003	Ernst-Christian Richter	543822001700	8749

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EXAMINER

KIM, PETER B

ART UNIT	PAPER NUMBER
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2851

DATE MAILED: 01/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/713,765

Applicant(s)

RICHTER ET AL.

Examiner

Peter B. Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 4-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on Dec. 23, 2005 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 8-11, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. (Matsuyama).

Matsuyama discloses an optical lithography method and an optical device for lithography (Fig. 2) for exposure of wafer (W) comprising refractive lens system (PL, para 0504) with a plurality of individual lenses (Fig. 14), a photomask (R), wherein in an area between the mask and the lens system is a medium (G1) provided which has a refractive index greater than 1.2 (para 247). The area between the lens system and the wafer is air which has a refractive index of approximately 1 (Fig. 2). Although Matsuyama does not disclose explicitly that the first, second and third order deflection intensity maxima are collected by the refractive system, Matsuyama

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discloses in Fig. 8 and 9, the beams of the light passing through the mask being collected by the lens of the optical system by passing through the medium. Because the purpose of providing different medium in an optical lithography method is to change the numerical aperture, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the medium and the lens to collect the different order of deflection intensity maxima in order to improve exposure.

Regarding the medium which completely fills the area between the mask and the lens, although Matsuyama does not disclose that the medium G1 completely fills the area, Matsuyama discloses that the thickness of the medium G1 is selected depending on the refractive index of the medium. Equation (2) of Matsuyama shows that as the refractive index of the medium is increased, the air interval between the mask and the lens is reduced, meaning the medium must fill the area between the mask and the lens. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the medium of index greater than 1.2 which fills the area between the mask and the lens because where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves only routine skill in the art.

Claims 4, 5, 9, and 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. (Matsuyama) as applied to claim 1 above, and further in view of Fukuda et al. (Fukuda) (JP 07220990).

The further difference between the modified Matsuyama and the claimed invention is the use of a liquid as a medium. Fukuda discloses an optical lithography method and an optical

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device for lithography (Fig. 1) for exposure of wafer (5) comprising lens system (7) with a plurality of individual lenses (Fig. 1), a photomask (3), wherein in an area between the mask and the lens system is a medium (14), which is water, which has a refractive index greater than 1.2. Fukuda teaches the medium, water completely filling the area between the mask and the projection system. Fukuda also teaches water, which has refractive index greater than 1.2, provided as a medium between the lens system and the wafer (Fig. 1, ref 14). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify Matsuyama with the water of Fukuda in order to improve resolution as taught by Fukuda in the abstract.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. in view of Fukuda et al. as applied to claim 1 above, and further in view of Eppler et al. (Eppler) (2002/0109237).

The further difference between the modified Matsuyama and the claimed invention is the liquid comprising perfluoropolyether (PFPE). Eppler discloses in para 0035, PFPE as the liquid for immersion. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide Matsuyama with PFPE of Eppler in order to obtain refractive index of 1.3 or higher.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. as applied to claim 1, and further in view of Komoriya et al. (Komoriya) (5,025,284).

The further difference between the modified Matsuyama and the claimed invention is the medium which is gas. Komoriya discloses the medium (7) between the mask and the lens system which is gas. Komoriya also teaches that the medium completely fill the area between the mask and the refractive lens system (col. 5, line 47 – col. 6, line 55). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the gas as the medium between the mask and the lens system and between the lens system and the wafer as in Fukuda in order to control and adjust the refractive index as taught by Komoriya in col. 6, lines 22-55.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. in view of Fukuda et al. as applied to claim 1, and further in view of Komoriya et al. (Komoriya) (5,025,284).

The further difference between the modified Matsuyama and the claimed invention is the medium which is gas. Komoriya discloses the medium (7) between the mask and the lens system which is gas. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the gas as the medium between the mask and the lens system and between the lens system and the wafer as in Fukuda in order to control and adjust the refractive index as taught by Komoriya in col. 6, lines 22-55.

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Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuyama et al. in view of Fukuda et al. as applied to claim 1, and further in view of Shiraishi (6,665,050).

The further difference between the modified Matsuyama and the claimed invention is a phase shift mask. Shiraishi discloses the use of a phase shift mask in a lithography exposure in col. 2, lines 45-58. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the phase mask of Shiraishi to the invention of Matsuyama in order to improve resolution as taught by Shiraishi in col. 2, lines 45-58.

Response to Arguments

Applicant argues that the cited references do not disclose collecting deflection intensity maxima of first, second and third order by the refractive lens. However, the purpose of changing the medium to increase the refractive index is to control the numerical aperture, and it only takes routine skill in the art to find the combination of lens with the aperture with the medium of certain refractive index to obtain the desired characteristic.

In response to the added limitation of the medium completely filling the area between the mask and the lens, the rejection based on the Matsuyama reference is modified.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter B. Kim whose telephone number is (571) 272-2120. The examiner can normally be reached on 8:00 AM - 5:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571) 272-2258. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Peter B. Kim
Primary Examiner
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January 26, 2006